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(54) Retractable window covering.

(57) A retractable covering devices, in particular, light control window covering (30) including a lobed head rail (10) to prevent creasing and/or skewing of the window covering when rolled up, the head rail (10) having means (20,25) for attaching the window covering which ensures proper alignment of the window covering (30). Also included are a bottom rear rail (40) having an anti-skewing device (48) which comprises a slidable weight for compensating for skewed roll up; a flip-catch device for preventing wrong-way roll up of the window covering; and a top-catch mechanism (62) for preventing both wrong-way roll up and over rotation in the proper roll up direction.

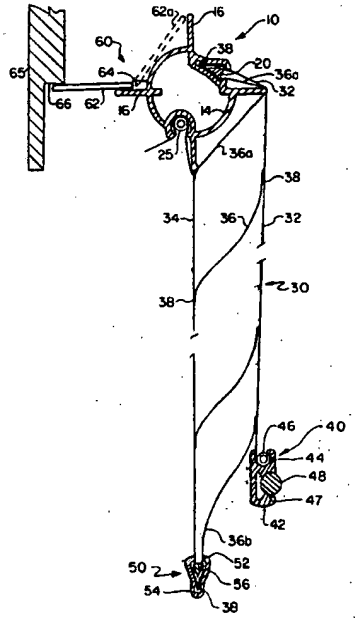


FIG. 3

EP 0 494 501 A2

The present invention relates to retractable covering devices useful for covering various architectural openings and as retractable space dividers. Most particularly, the present invention relates to roller type deployment and mounting of light control window coverings having first and second parallel sheets and a plurality of transverse vanes connecting said sheets.

US-A-3384519 discloses a shade having two parallel mesh fabric sheets with a number of movable vanes disposed between the sheets. This shade is attached to a typical cylindrical roller shade head roller for rolling up the parallel fabric sheets and controlling the angle of the blades. Similar disclosures are found in US-A-2029675 and 2140049 and FR-A-1309194. DE-A-382758 discloses a similar window covering, however instead of a cylindrical head roller an elliptical head roller is provided.

As illustrated in the above disclosures, such a window covering is generally a sandwich of three layers which are attached together at various points. As the sandwich rolls around a roller, the layer around the outside must travel a greater distance than the inner layer. The thicker the sandwich is, and particularly the blades, the more pronounced this effect becomes. Thus, as the window covering rolls up around the head roller, the outer layer must stretch or the inner layer must buckle. Stretch fabrics are undesirable because the blades would be unaligned in the lowered position and if non-stretch fabrics are used the inner layer must form buckles. However, buckles can cause a permanent wrinkle or crease to develop in the fabric over time. This is because as the window covering is wrapped tightly around the roller there is a constant pressure compressing the buckle in the inner layer between the other layers and against the roller itself. In addition to an unattractive appearance, the buckles also create a high point on the roller which can occur unevenly and cause the window covering to roll up unevenly or skew to one side of the roller.

US-A-4344474 discloses an insulated shade which includes a number of layers wrapped around a cylindrical head roller. The layers appear to be connected together by bushings and because the different layers will roll up at different rates, journal plates are provided having slotted holes to retain the bushings. This allows relative sliding between the bushings in an attempt to compensate for the different roll up rates of the different layers.

In roller shades in general it is important that the fabric be fastened to the head roller at an exact right angle to the cut edges of the fabric, to ensure that the fabric rolls up straight along the head roller without skewing to the left or right. The curtain roller disclosed in US-A-286027 is an attempt to solve this problem in typical single sheet roller shades. Two slats are provided, one having tacks extending outward therefrom. The slat with tacks is positioned at the top of the curtain, at a right angle to the longitudinal line of direction of the curtain. The tacks are pressed through the curtain fabric and the second slat is pressed on to the tacks on the opposite side of the curtain. The slats attached to the curtain are slid into a complementary groove in the roller. This construction has disadvantages in not being self aligning and requiring that the slats be placed very exactly on the curtain fabric.

A further drawback of known deployment systems for this type of window covering is that they may be rolled up the wrong way. This would result in the blades being folded back over themselves at the point of attachment to the fabric sides so that the bulk of the window covering when rolled up would be increased and, if the blades were initially made without creases at the attachment points, creases would be formed due to the folding over.

According to the present invention, there is provided a retractable covering device comprising a light control element having first and second parallel sheets and a plurality of adjustable transverse vanes attached to said sheets along attachment lines, said vanes being carried between and connecting said sheets, and a roller rotatable about a longitudinal axis for rolling and unrolling said light control element, said roller including a plurality of means defining apexes on an outer surface thereof, said apex defining means providing longitudinal contact points for said light control element around said roller and said apex defining means being circumferentially spaced apart on said roller so as to provide a substantially straight path for said light control element from one apex defining means to an adjacent apex defining means, and said roller further including means for attaching said light control element.

Such a construction does not create permanent creases or wrinkles in the layers, because the roller has a discontinuous surface formed by outwardly extending lobes or rounded projections which define recesses to receive buckles formed in the inner layer of the covering device as it is rolled on the roller. Thus, the buckles are not pressed against the roller to form permanent creases or wrinkles. Also the buckles do not create high spots which would cause the covering device to skew to the left or right when rolled onto the roller. In this regard, according to further aspect of the present invention there is provided a bottom rail with a slidable weight which may be selectively transversely positioned to compensate for inconsistencies in manufacture and mounting which lead to skewing.

Preferably the attachment means comprises at

least one recess formed in said roller for receiving the line of attachment between one of said sheets and a vane, said recess or recesses being parallel to the roller axis, and means for holding said line of attachment in said recess. In this way one can ensure alignment of the covering device with the head roller. Because all vanes are parallel to one another, they are then parallel to the roller.

The holding means may include a triangular channel in the head roller which receives a wedge shaped filler strip. The wedge shape of the filler strip cooperates with one of the sheer fabrics and the top vane of the covering device to force the window covering along the line of attachment between the vane and fabric into the triangular channel, thus ensuring proper alignment. A second channel may be provided for attaching the opposite sheer fabric and is designed to tension the first vane against the wedge shaped filler strip, thus further ensuring proper alignment. The second channel may be provided with a part circular cross-section formed in the roller. The second sheer fabric is wrapped around a resilient tubular clamping member which is forced into the circular channel. In another embodiment, the second channel is V-shaped and the second sheer fabric is secured to a complementary V-strip and inserted in the V-shaped channel such that the second sheer fabric is firmly held between the V-shaped channel and the V-strip. Alternatively, the first and second sheer fabrics are attached to the roller simultaneously by securing both the first and the second sheer fabrics to the same slat or strip and then force fitting this common slat or strip into a complementarily shaped roller.

Additionally, an elongate member may be attached along the bottom of the covering device utilizing the triangular channel and a wedge shaped filler strip to provide a finished appearance to the shade. This bottom rail assembly may have a C-shaped cross-section.

According to another aspect, the invention provides a device for preventing a roller shade roller from rolling up the wrong way, said roller including an elongate support member with at least one projection extending radially therefrom, said device comprising a connecting member spaced away from said roller and fixed with respect to said roller and a catch member pivotally mounted on said connecting member and biased toward said roller such that as the shade is unwound from the roller, the catch member contacts the outer surface of the wound up portion of the shade and when the shade is completely unwound, the catch member engages the projection extending from the support member to prevent rotation of said roller past a predetermined point.

The present invention also provides a retractable window covering comprising a roller a light control element windable up by said roller, a catch member pivotally connected to said roller and movable between a first position pivoted inward and accommodated at least partially inside said light control element when rolled around said roller, and a second position pivoted outward and engaging an associated stop member fixed relative to said roller, whereby when the light control element is substantially further unwound from the roller said catch member is uncovered and pivots outward from said roller to engage said stop member and thereby stop rotation of said roller past a predetermined point, and whereby as the light control element is wound onto said roller said catch member pivots in against said roller and is accommodated at least partially inside the light control element when wound further onto said roller.

In order that the present invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings in which:-

Figure 1 is a front elevation view of one embodiment of window covering according to the present invention;

Figure 2 is a rear elevation view of the window covering of Figure 1;

Figure 3 is an enlarged cross-sectional view of the window covering of Figure 1 taken along line 3-3 in Figure 1;

Figures 4a-c are cross-sectional views of one embodiment of head roller and flip-catch mechanism according to the present invention, sequentially illustrating the operation of the flip-catch mechanism;

Figure 5 is an enlarged cross-sectional view of the head roller of Figures 4a-c illustrating the function of the lobed projections;

Figure 6 is a cross-sectional view of a typical prior art head roller;

Figure 7a-b are perspective end views showing the roller and roller end cap provided with a flip-catch device;

Figure 8 is a partial cross-sectional view of an alternative attachment means according to the present invention;

Figures 9a-b are partial cross-sectional views of a further attachment means according to the present invention;

Figure 10 is a top view of another embodiment of a window covering of the present invention, including means for mounting the window covering on a wall or ceiling;

Figure 11 is an enlarged cross-sectional view taken along line 11-11 of Figure 10;

Figures 12a, 12b and 12c are partial cross-sectional views of an alternative bottom rail assembly according to the present invention;

Figure 13 is a cross-sectional view of another embodiment of a head roller according to the present invention;

Figures 14a and 14b are cross-sectional views of a head roller and top-catch mechanism according to the present invention, illustrating the operation of the top-catch mechanism;

Figure 14c is an enlarged cross-sectional view of a portion of an alternative embodiment of the top-catch mechanism;

Figure 15 is a cross-sectional view of another embodiment of a head roller and top-catch mechanism; and

Figure 16 is a cross-sectional view of yet another embodiment of a head roller and flip-catch mechanism according to the present invention.

While the description of the invention is made below with reference to window coverings, the teachings of the present invention are also applicable to devices for covering openings of all types and also for use as room dividers. As shown in Figures 1 and 2, a head roller assembly 10 mounts a light control window covering 30 provided with a rear bottom rail assembly 40 and front bottom rail assembly 50. Also illustrated is valance 65 which cooperates with flip-catch mechanism 60, shown in Figure 3. The head roller assembly 10 is rotatably mounted and driven in a known manner by a chain or cord 11 cooperating with wheel 12.

As shown in Figure 3, the light control window covering 30 includes first and second parallel sheer fabrics 32 and 34 which are connected by a number of transverse fabric vanes 36 to form a light control element. Relative motion of first and second sheer fabrics 32 and 34 in a direction perpendicular to vanes 36 changes the angle of the vanes and thus controls the amount of light admitted through the window covering. Preferably, vanes 36 are bonded to the sheer fabrics by adhesive bond lines 38 exactly perpendicular to the longitudinal edges of the sheer fabrics 32,34 and in a manner which tends to bias first and second sheer fabrics 34 and 32 towards one another. The present invention relates to apparatus and methods for mounting and deploying such coverings, and may be used with coverings made with any flexible sheet material and flexible, strip material for the sides and vanes of the covering device. Reference to sheer fabrics and fabric vanes should not be considered as limiting of the present invention.

The head roller assembly 10 shown in greater detail in Figure 5 includes a rigid central support member 14 provided with a number of (in this instance four) lobes or rounded projections 16. The number of lobes may be chosen to suit the size of the head roller and the characteristics of the fabric.

Lobes 16 allow the fabric window covering to wrap around four linear bumps 17 extending transversely across the window covering 30. The window covering wraps tightly at bumps 17 and then follows a relatively straight line to the next linear bump 17. Lobes 16 provide a discontinuous surface with recesses 18 formed between lobes 16. The window covering is thus able to wrap loosely with relatively low pressure on the layers located in recesses 18 between the lobes 16. Buckles 19, which develop between the fabric layers of window covering 30 due to the layered construction, form in the loosely wrapped straight portions between lobes 16 and are not set into the window covering by pressure against the head roller because they fall within recesses 18. Also, because the buckles 19 occur in recesses 18 and are not pressed against the roller as in the prior art, window covering 30 wraps tightly around lobes 16 and rolls up straight without skewing.

Although lobes 16 which project radially outwardly from the support member 14 are illustrated in Figure 5, the linear bumps 17 can be provided directly on the surface of the support member. For example, the support member can be rectangular in cross-section, with the four corners of the rectangular support member defining the linear bumps. The number of linear bumps is not limited to four, and support members of any regular or irregular polygonal cross-section can be used provided that there is a relatively straight line path of sufficient length between adjacent linear bumps to provide an area in which the window covering is loosely wrapped and not compressed. As a practical matter, suitable polygonal support members are those having at least 3 and preferably no more than 6 sides. Support members having a modified polygonal cross-section are also suitable for use in this invention. For example, the sides extending between the linear bumps may be curved inwardly, rather than straight, in order to provide deeper recesses for receiving the buckles formed in the covering. The support member can also have only two linear bumps or contact points for the window covering. Examples of such a structure include a substantially flat support member wherein the longitudinal edges of the support member define the linear bumps, or two spaced apart cylindrical rods of small diameter, wherein each cylindrical rod defines a linear bump and the spaces between the two cylindrical rods provides the recesses for the buckles.

In order to prevent the buckles which form in the loosely wrapped straight portions between linear bumps from being set in the window covering, each straight line path between linear bumps is preferably at least 12.5 mm in length.

As previously discussed, it is important that the fabric of roller shades be fastened to the head roller at an exact right angle to the edges of the

fabric, firstly to ensure that the fabric will roll up straight along the head roller without skewing to the left or right, and secondly to ensure the correct alignment of the vanes, so that the window covering will close all the way and will operate correctly when fully deployed.

As illustrated in Figure 5, a wedge shaped filler strip 20 is placed between sheer fabric 32 and top vane 36a. The wedge shape of the filler strip 20 centers itself against the adhesive line 38 which bonds sheer fabric 32 and top vane 36a. The fabric and filler strip are then inserted into a complementary wedge shaped channel 22 from one end of head roller assembly 10. Alternatively, the head roller may be designed to accept the filler strip by inserting it generally radially with a snap fit. As the fabric is inserted into channel 22 adhesive line 38 is forced by wedge shaped filler strip 20 into a recess at the vertex of channel 22, which is parallel to the roller axis and receives the adhesive line. This ensures the centering of the fabric construction in channel 22 along head roller central support 14 and attachment at a right angle to the head roller.

In an alternative embodiment, shown in Figure 8, a channel 70 is provided in head roller 72 with a longitudinal recess 74 parallel to the roller axis. Insertion of a filler strip 76 locates adhesive line 38 in longitudinal recess 76 along the length of head roller 72 to guarantee correct alignment of the window covering. Channel 70 and filler strip 76 need not be circular as shown in Figure 8. Practically any cross-sectional shape will perform as desired if recess 74 is formed parallel to the roller axis and the channel and filler strip cooperate to prevent slippage of the fabric. Filler strip 76 may be resilient compressible material which is capable of insertion through the radially directed opening of channel 70, or it may be a less resilient material which is inserted into channel 70 through an opening at one end.

Second sheer fabric 34 is secured into a second, circular channel 24 by wrapping around a length of compressible tubing 25 sized to be pressed into channel 24. A 4.8 mm vinyl tubing with a complementarily sized channel has been found adequately to secure the fabric. The attachment of the second sheer fabric in this manner pulls vane material 36a tightly across lobes 16 and thus ensures that adhesive line 38 is centered on the wedge shaped filler strip 20 to guarantee perpendicular alignment of the window covering with the head roller.

An alternative embodiment for the attachment of second sheer fabric 34 to the head roller is shown in Figures 9a and 9b, in which one leg of a V-shaped channel 82 has a inwardly projecting stop 84 and the opposite leg extends outward, beyond stop 84. V-strip 86 is provided having a longer leg 88 and a shorter leg 90. Second sheer fabric 34 is passed around V-strip 86 with the cut off edge 35 of second sheer fabric 34 positioned adjacent to and extending slightly beyond shorter leg 90. Adhesive transfer tape 92 is provided at least on shorter leg 90 to grip, at least temporarily, the fabric. The V-strip is then inserted into channel 82 as indicated by arrow 94. The V-strip cooperating with the V-shaped channel, combined with the adhesive transfer, helps to ensure that the second sheer fabric is attached perpendicular to the V-shaped channel. The biasing force of V-strip 86 in channel 82 also pulls first vane 36a tightly across the lobes as required.

V-strip 86 is preferably made of a resilient material to allow a snap fit into channel 82. It has been found that polycarbonate or a polyester such as 0.25 mm MYLAR provides sufficient stiffness to hold the fabric yet retains the resilience necessary for a snap fit.

The various attachment means are illustrated in the drawing figures with component parts spaced apart in order to clearly illustrate each layer and part. In practice, the fabric layers are tightly pressed between the adjoining parts.

When the window covering 30 is fully unrolled from head roller assembly 10, the angle of vanes 36 may be controlled by rotation of the head roller assembly. In order to provide the window covering with a crisp and taut appearance and also ensure that the vanes 36 move correctly between open and closed positions, a weighted rear bottom rail assembly 40 is provided. The rear bottom rail assembly also provides an anti-skew device which is useful not only with fabric light control window coverings, but with any type of roller shade.

Even with the lobed headrail as discussed above, slight inconsistencies in manufacture, or mounting of the head roller slightly off of the horizontal line can cause the window covering to skew to the left or right when rolled up. Rear bottom rail assembly 40 includes a rigid member 42 provided with a circular channel 44 and compressible tubing 46 (Figure 3) for attachment of sheer fabric 32. Preferably, however, attachment means such as shown in Figures 9a and 9b, including V-shaped channel 82 and V-strip 86, is utilized for the rear bottom rail assembly.

Rigid member 42 is also provided with channel 47 which slidingly receives weight 48. The position of weight 48 along channel 47 may be fixed by retainer clips 49 (shown in Figure 2) which may be squeezed to slide in channel 47 and released to grip the channel. If, for example, the window covering was skewing to the right as it was rolled up, this could be corrected by sliding weight 48 to the right. This creates a greater tension on the right

hand side of the window covering, causing the window covering to be rolled tighter around the head rail on that side and thus have a smaller diameter which will cause the shade to begin to skew to the left. Weight 48 may be moved back and forth until the window covering rolls up straight without left or right skewing.

Front bottom rail assembly 50 provides a decorative finish for the bottom front of the window covering and includes a rigid member 52 having a channel 54 which receives wedge shaped filler strip 56 placed between vane 36b and second fabric 34 to secure bottom rail assembly 50 to the window covering. Wedge shaped filler strip 56 ensures that the front bottom rail assembly 50 is parallel to vanes 36 and perpendicular to the first and second sheer fabric edges. Alternatively, the embodiment shown in Figure 8 may be utilized. In a further alternative embodiment, the front and rear bottom rails may be combined into a single bottom rail.

The embodiment of the present invention shown in Figures 10 and 11 includes a valance 400, mounting brackets 420, top-catch mechanism 320, head roller assembly 110, window covering 130 and bottom rail assembly 150. The valance 400 may be fabricated as a single, unitary structure; however, as shown it comprises three separate parts: a front rail 402 and two opposed end caps 404,406, provided with complementary ribs and grooves to enable end caps 404,406 to be removably snap fit onto the opposed ends of front rail 402. Referring now to Figure 11, the rib 407 of end cap 404 is received in groove 403 of front rail 402 to join the front rail 402 to end cap 404. The end cap 404 has a cylindrical projection 408 provided on the inner surface thereof and the end cap 406 has a similar projection (not shown) for mounting the head roller assembly 110 of window covering 130 in the valance 400.

Two mounting brackets 420 are provided to mount the valance 400 against a wall or against a ceiling to cover a window. Each mounting bracket 420 is provided with a groove 422, for securely receiving the upper edge 401 of the front rail 402 of the valance 400. Each mounting bracket 420 can be provided with additional features, such as ribs, grooves and the like which are complementary to the rib and groove structure of the inner surface of the front rail 402, to provide additional points of engagement and support between the mounting brackets 420 and the valance 400.

An important advantage of using mounting brackets 420 is that they need not be precisely located on the wall or ceiling so as to support the very ends of the valance 400 or the head roller assembly 110. In contrast to conventional mounting means for roller type window coverings, there is considerable latitude for the relative placement of mounting brackets 420 on a wall or ceiling. Provided that the mounting brackets 420 are spaced apart sufficiently adequately to support the valance 400 in proper alignment, the exact spacing between mounting brackets 420 on a wall or ceiling is not critical. Mounting brackets 420 are conveniently secured to a wall by screws or the like inserted into a wall through hole 422 in the downwardly extending leg 424 or into a ceiling through holes 424 in the upper leg 428 of the mounting bracket 420.

The other main components of this embodiment are head roller assembly 110, light control window covering 130 and bottom rail assembly 150. Head roller assembly 110 includes a rigid central support member 114 provided with a number of lobes or rounded projections 116,118,120,122. Recess 117 is formed between lobes 116 and 118, and recess 119 is formed between lobes 118 and 120. In the embodiment of Figure 11, in contrast to the embodiment of Figure 5, each of the lobes or rounded projections 116,118,120,122 has a different structural configuration. Lobe 116 is similar in structure to lobe 16 of the head roller assembly 10 of Figure 5. Lobe 118 extends outwardly from the longitudinal axis of the rigid support member 114. However, lobe 118 is an angled projection and does not extend radially outwardly from support member 114 as does lobe 116.

Lobe 118 also forms one leg of a V-shaped channel 126. The opposite, shorter leg 128 is formed along the outer surface of support member 114 and terminates in stop 129, which projects outwardly from the surface of the support member 114 and inwardly into V-shaped channel 126. The V-shaped channel 126 of the head roller assembly 110 cooperates with a V-strip 86 to secure the second sheer fabric 134 to the head roller assembly 110, in the manner described above with reference to Figures 9a and 9b.

Head roller assembly 110 also includes wedge shaped channel 125, which is configured to be complementary to a wedge shaped filler strip 20. In a similar manner to the arrangement of Figure 5, the wedge shaped filler strip 20 and channel 125 attach the window covering 130 to the head roller assembly 110 and ensure proper alignment of the first and second sheer fabrics 132,134 and the vanes 136 with respect to the head roller.

Lobe 120 extends outwardly from the longitudinal axis of the support member 114. However, instead of a straight radially outwardly extending projection 116, lobe 120 is formed by two legs 144,146, leg 144 extending substantially radially outwardly with respect to the longitudinal axis of the support member 114 and leg 146 of the lobe 120 extending from the distal end of leg 144 to a location along the support member 114 adjacent

the end of the channel 125. When the window covering 130 is secured to the head roller assembly 110 by a wedge shaped filler strip 20 inserted in 125, the top vane 136a is supported against the sloping leg 146 to the lobe 120.

Lobe 122 extends radially outwardly from the longitudinal axis of the support member 114, and is formed by an eccentric portion of the support member 114, rather than a separate outward projection from the circumferential surface of the support member 114 like projections or lobes 116,118,120. Alternatively lobe 122 may extend radially outwardly a distance more than, equal to or less than lobes 116,118 and/or 120. Similarly, in other embodiments of the head roller assembly of the invention, the distances which the lobes or projections extend from the support member, relative to one another, are not critical.

In the embodiment shown in Figure 11, a single bottom rail assembly 150 is provided, including a single, extruded structure 151, preferably of extruded aluminum, having a substantially C-shaped cross-section. A longitudinally extending weight receiving channel 152 is provided in the bottom of bottom rail 151, in which is slidably received a weight 154 which is retained therein by retaining lips 156,158 of the bottom rail 151. The position of weight 154 within channel 152 can be adjusted as necessary to counteract any skewing of the window covering 130 as it rolls up around the head roller, as described above.

As shown in Figures 12a and 12b, the bottom portion of the window covering 130 is secured to the bottom rail assembly 150 by placing a thin slat 160 of stiff and resilient material, such as aluminum or a suitable plastic material, against the downwardly facing side of the lowermost vane 136b. The ends of first fabric 132 and second fabric 134 are at least temporarily secured to the underside of the thin slat 160 by transfer tape 162. The thin slat 160 with the ends of fabrics 132,134 secured thereto is then press or snap fit into the bottom rail 151 by exerting a bending force on the thin slat 160, the width of which is greater than the distance between the surfaces 168,170 of curved edges 164,166, respectively of the bottom rail 151. The thin slat 160, because of its resilience, can be bowed or curved to fit under curved edges 164,166 and upon releasing curved edges 164,166 retain the thin slat 160 in the bottom rail 151 and securely hold the ends of the fabrics 132,134. Preferably, the thin slat 160 is bowed or curved about 30° for snap-in and curves back or loses part of its curve after having been snapped in. In one embodiment of the invention, the thin slat 160 remains curved at about 20° after having been snapped in, this curvature making the width of the slat far less critical.

The curved or C-shaped structure of bottom rail assembly 150 allows the bottom rail assembly to roll up behind the rolled up fabric of the window covering in a minimum amount of space (see Figure 14a). Further, the curved structure of the bottom rail imparts a curve to the snap-in slat, by applying tension to the ends of the slat. The outward force exerted by the curve of the slat against the curved edges of the bottom rail holds the fabric tightly at these points. Finally, the curve in the slat also makes up for the distance differences between the front and rear fabrics caused by the extent of travel of the respective fabrics around the ends of the slat and, more importantly, the ends of the slat exert an outward pressure at the inside edges 166,164 of the bottom rail 151.

In another embodiment, shown in Figure 13, two adjacent lobes or projections 202,204 of the head roller 200 are provided with curved, retaining edges 210,212, respectively. Remaining lobes 206,208 may be of any suitable configuration, such as rounded projections. The lobes 202,204 cooperate with a thin slat 214 of a stiff, springy material to secure the top ends of the first fabric 232 and the second fabric 234 of the window covering 230 to the had roller 200.

One surface of the thin slat 214 is held against the upper surface of uppermost vane 236a and then the ends of the first fabric 232 and the second fabric 234 are at least temporarily secured to the other surface of the thin slat 214 by transfer tape 240. Then, the thin slat 214, with the window covering 230 at least temporarily secured thereto is press or snap fit between the lobes 202,204 of the head roller 200 by exerting a bending force on the thin slat 214. When the bending force is released, the thin slat 214 straightens out somewhat and is retained in place on the head roller 200 by the curved retaining edges 210,212, thereby securing the window covering 230 to the head roller 200. Again, the thin slat 214 preferably remains bowed or curved after it has been snapped into the head roller 200, so that the slat 214 exerts an outward pressure force against the inner portions of the retaining edges 210,212 of the lobes 202,204, respectively. Further, the curved slat provides an accommodation space for the window covering when it is rolled up. The degree of curvature of the slat 214 is not critical and the slat may be substantially straight after being snapped into the head roller.

A fabric light control window covering deployed such as in the present invention is operated by first unrolling the window covering and then continuing to rotate the head roller in order to articulate the vanes. However, if the head roller is rotated in the unroll direction beyond a certain point the window covering will begin to roll up in the wrong direction. This will cause the vanes to bend back on them-

selves and possibly form creases in the vanes which could create an uneven appearance or impair the operation of the window covering. Also, with the vanes bent back over themselves the window covering will be extremely bulky when rolled up and may not fit into the space allotted for the head roller. Thus, the present invention provides a flip-catch mechanism 60 for preventing wrong-way roll up of the window covering. In fact the flip-catch mechanism is useful for roller shades of all types in which it is desired to prevent wrong-way roll up.

Flip-catch mechanism 60 includes arm 62 which is secured to the head roller by hinged attachment 64. Also provided is a cooperating top 66 which may be included as part of an associated valance 65. Arm 62 is movable between a first position engaging stop 66 and a second position, indicated in dotted lines at 62a, resting in one of the recesses 18 between lobes 16.

The operation of flip-catch device 60 is illustrated in Figure 4a-c. Beginning with Figure 4a, arm 62 is in the second position resting in recess 18 with window covering 30 wrapped around head roller assembly 10. Window covering 30 is unrolled by rotating the head roller assembly 10 in the direction indicated by arrow 68. Arm 62 is retained in the second position by the wrapped around window covering 30, but once the window covering has been unrolled to the point where it no longer extends completely around head roller assembly 10 (Figure 4b), arm 62 moves from the second position, between the lobes, due to the force of gravity as it is rotated around the bottom of head roller assembly 10. Further rotation of head roller assembly 10, in the direction of arrow 68, causes arm 62 to engage lobe 16a as shown in Figure 4c. Still further rotation of head roller assembly 10 in the same direction brings arm 62 into contact with stop 66 and thus prevents further rotation of head roller assembly 10 in that direction, as shown in Figure 3. When the window covering is rolled up, rotation of the head roller assembly 10 in the opposite direction of arrow 68 automatically causes arm 62 to move back into the second position inside window covering 30 and resting between lobes 16.

As shown in Figures 14a and 14b, an alternative top-catch mechanism 350 includes a swing arm 352 having a downwardly extending terminal portion 354. The end 356 of the swing arm 352 opposite the terminal portion 354 is pivotally mounted such that swing arm 352 pivots around pivot point 358 relative to a connecting arm 364 connected to the valance 400. Preferably, the edge 360 of the terminal portion 354 has a curved channel 362 formed therein.

The top-catch mechanism 350 also includes spring means 366 which exerts a light downward spring force against the swing arm 352 and thus biases the swing arm 352 toward the head roller 110.

In operation, beginning with Figure 14a, the window covering 130 is in the completely rolled up state and further rotation of the head roller 110 in the roll up direction, indicated by arrow 370, is prevented by the top-catch mechanism 350. The downward spring force exerted by spring means 366 biases the lower surface of the terminal portion 354 of the swing arm 352 toward the rolled up fabric of the window covering 130. The edge of the bottom rail 151 abuts against the edge 360 of the terminal portion 354 of the swing arm 352, preventing further rotation of the head roller 110. As shown, the channel 362 formed in the terminal portion 354 of the swing arm 352 and the outer edge of the bottom rail 151 are complementarily shaped so that the bottom rail 151 abuts securely against the terminal portion of the swing arm 352 and the channel 362 positively grabs the outer ends of the bottom rail 151 without sliding off and without scratching or marring of any decorative finish on the bottom rail.

Window covering 130 is unrolled by rotating the head roller assembly 110 in the direction indicated by arrow 375. The downward spring force applied to swing arm 352 by spring means 366 is light enough to ensure that as the window covering 130 is unrolled, the lower surface of the terminal portion 354 passes along the surface of the outermost layer of rolled fabric. The pivot point permits the swing arm to move up and down as required by the irregular configuration of the outer surface of the rolled fabric. As shown in Figure 14b, after the window covering 130 has been completely unrolled, the shoulder 355 of the terminal portion 354 of the swing arm 352 contacts the lobe 116 of the head roller assembly 110, preventing further rotation of the head roller 110 in the wrong roll up direction. Figure 14c is an enlarged view of a portion of an alternative embodiment of the top-catch mechanism 350a, showing the end of the lobe 116 contacting the shoulder 355a of the terminal portion 354a of the swing arm 352a. In this embodiment, the shoulder 355a of the top-catch mechanism 350a has a shape complementary to that of the end of the lobe 116.

Top-catch mechanism 350 prevents wrong way roll up and down of the window covering and prevents jamming of the head roller assembly which can be caused by rotating the head roller too far in the proper roll up direction, thereby causing the bottom rail assembly or assemblies to rotate around the head roller and become jammed between the valance and the head roller. The top-catch mechanism is useful for roller shades of all

types in which it is desired to prevent wrong-way roll up and/or over rotation of the head roller in the proper roll up direction.

As shown in Figures 15 and 16, respectively, the top-catch mechanism 350 can be used in conjunction with head roller 10 and valance 400, and flip-catch mechanism 60 can be used together with head roller 110 and valance 400 to prevent wrong way roll up. Although various embodiments and aspects of the present invention have been described, including specific combinations of head rollers, bottom rails, valances and means for preventing wrong way roll up of window coverings, it is to be understood that the individual components of the inventive mounting apparatus may be combined in any desired combination, not just the exemplary combinations specifically described above.

Claims

1. A retractable covering device comprising a light control element (30,130) having first and second parallel sheets (32,34) and a plurality of adjustable transverse vanes attached to said sheets (36) along attachment lines (38), said vanes being carried between and connecting said sheets, and a roller (10,110,200) rotatable about a longitudinal axis for rolling and unrolling said light control element, said roller including a plurality of means (16,18,116,118,202-208) for defining apexes on an outer surface thereof, said apex defining means providing longitudinal contact points for said light control element around said roller and said apex defining means being circumferentially spaced apart on said roller so as to provide a substantially straight path for said light control element from one apex defining means to an adjacent apex defining means, and said roller further including means (20,24,25,214) for attaching said light control element.

2. A covering device according to claim 1, wherein said attaching means comprises at least one recess (24,38,82) formed in said roller for receiving the line of attachment between one of said sheets (32,34) and a vane (36), said recess or recesses being parallel to the roller axis, and means (20,25,76,82) for holding said line of attachment in said recess.

3. A covering device according to claim 2, wherein said recess or one of said recesses comprises a longitudinal channel (38) having a triangular cross-section provided on the outer surface of said roller, said triangular channel having an outwardly directed longitudinal opening along its base and a longitudinally extending vertex opposite said opening with said recess lying in said vertex, and wherein said holding means comprise an elongated wedge-shaped member which cooperates with said vane and said sheet to force said line of attachment between said vane and said sheet into the vertex of said triangular channel to ensure parallel alignment of said vane with said roller.

4. A covering device according to claim 2 or 3, wherein said recess or one of said recess comprises a longitudinal channel (82) formed in said roller having a V-shaped cross-section with an inward projection (84) of one of the legs of the V-shape, and a resilient V-shaped strip (86), one leg (90) of which engages behind said projection (84) when placed in said V-shaped channel, whereby one of the said sheets (32,34) is wrapped at least partially around the V-shaped strip and engaged in the channel by the V-shaped strip (86).

5. A covering device according to claim 2, 3 or 4, wherein said recess or one of said recesses comprises a longitudinal channel (24) having a circular cross-section with a longitudinal opening having a width less than the diameter of the channel, and a resilient tubular member (25,76) which is compressible for placement through said opening, whereby one of said sheets is wrapped at least partially around the tubular member and engaged in the channel by the tubular member.

6. A covering device according to claim 1, wherein said apex defining means (202,204) includes at least two projections (210,212) extending longitudinally along and radially outwardly from said roller, and said attaching means includes said two projections (210,212), each of said two projections terminating in a retaining edge, and an elongate strip (214) extending between the retaining edges of said two projections and retained thereby, the upper edge portions of said first and second sheets (32,34,232,234) extending around respective longitudinal edges of said elongate strip and being secured between said two projections and said elongate strip by pressure exerted by said elongated strip against said two projections to securely attach said light control element to said roller.

7. A covering device according to claim 6, wherein said elongate strip (214) is retained by

the retaining edges of said two projections such that said elongate strip is bowed.

8. A covering device according to any preceding claim, further comprising a catch member (62) pivotally connected to said roller and movable between a first position pivoted inward and accommodated at least partially inside said light control element (30,130) when rolled around said roller (10,110,200), and a second position pivoted outward and engaging an associated stop member (66) fixed relative to said roller, whereby when the light control element is substantially further unwound from the roller said catch member (62) is uncovered and pivots outward from said roller to engage said stop member (66) and thereby stop rotation of said roller past a predetermined point, and whereby as the light control element is wound onto said roller said catch member pivots in against said roller and is accommodated at least partially inside the light control element when wound further onto said roller.

9. A covering device according to any preceding claim, and further comprising a device (35) for preventing the light control element from rolling up the wrong way, said device including a connecting member (364) spaced away from said roller (10,110,200) and fixed with respect to said roller and a catch member (352) pivotally mounted on said connecting member (364) and biased toward said roller such that as the light control element is unwound from the roller, the catch member contacts the outer surface of the wound up portion of the light control element and when the light control element is completely unwound, the catch member engages one projection (116) extending from the roller to prevent rotation of said roller past a predetermined point.

10. A covering device according to any preceding claim, wherein a first elongate member (40) having a channel (44) and a cooperating retainer member (46) is attached along the bottom edge of said first sheet and wherein a second, separate elongate member (50) also having a channel (54) and a cooperating retainer member (56), is attached along the bottom edge of the second sheet (34).

11. A covering device according to claim 10, wherein said second elongate member (50) has a recess formed therein for receiving the line of attachment (38) between said second sheet (34) and a vane 136), said recess being parallel to the longitudinal direction of the second elongate member, said channel (54) having a triangular cross-section defined by said second elongate member (50) with an outwardly directed longitudinal opening along its base and a longitudinally extending vertex opposite said opening, with said recess lying in said vertex and said retainer member is an elongate wedge-shaped member (56) which cooperates with said vane (36) and said second sheet (34) to force said line of attachment between said vane and said sheet into the vertex of said triangular channel to ensure parallel alignment of said vanes with said bottom rail.

12. A covering device according to claim 10, wherein the channel of said second elongate member has a V-shaped cross-section (82) with an inward projection (84) when placed in said V-shaped channel whereby one of said sheets is wrapped at least partially around the V-shaped strip and engaged in the channel (82).

13. A covering device according to claim 10, 11 or 12, wherein the channel (44) of said first elongate member has a circular cross-section defined by said first elongate member, said channel having an opening less than the inside diameter of the channel and said retainer member (46) is a resilient tubular clamping member for clampingly engaging said second sheet in said longitudinal channel by wrapping said one sheet around said member and forcing said member through said opening.

14. A covering device according to any one of claims 1 to 9, wherein an elongate member (150) is attached along bottom edge portions of both said first and second sheets (32,34).

15. A covering device according to claim 14, wherein said elongate member (150) includes a substantially C-shaped cross-section channel opposed longitudinal inward projections (168,170) and a resilient elongate strip (160), has each longitudinal edge engaging behind one of said longitudinal inward projections and said elongate strip exerts pressure thereon for securing said light control element in said elongate member when said elongate strip is inserted in said elongate member, whereby the bottom edges of the first and second sheets (132,134) are wrapped around respective longitudinal edges of said elongate strip and said strip is inserted in said C-shaped channel to attach said elongate member to said light control element.

16. A covering device according to claim 15, wherein when said elongate strip (160) is engaged behind said longitudinal inward projections, said elongate strip is bowed.

17. A covering device according to any one of claims 8 to 16, wherein said elongate member (150) or at least one of said first and second separate elongate members (40,50) includes an anti-skew device in the form of a weight (48,154) and means (47,49,152) for selectively positioning said weight along the length of said elongate member, to reduce or eliminate skewing of said window covering during rolling and unrolling thereof.

18. A bottom rail for a roller shade, comprising an elongate member attached along a bottom edge of said shade and a weight carried by said elongate member, the position of said weight being adjustable transversely with respect to said shade, whereby the transverse position of the weight may be readily adjusted to prevent skewing when rolled up.

19. A device for preventing a roller shade roller (10,110,200) from rolling up the wrong way, said roller including an elongate support member (14,114) with at least one projection (16,116,208) extending radially therefrom, said device (350) comprising a connecting member (364) spaced away from said roller and fixed with respect to said roller and a catch member (352) pivotally mounted on said connecting member and biased toward said roller such that as the shade is unwound from the roller, the catch member contacts the outer surface of the wound up portion of the shade and when the shade is completely unwound, the catch member engages the projection (16,116,208) extending from the support member to prevent rotation of said roller past a predetermined point.

20. An anti-skew device for eliminating skewing of a retractable window covering while the window covering is being rolled around and unrolled from a roller, said anti-skewing device comprising a weight (48,154), and means for selectively positioning said weight on said window covering to eliminate skewing of the window covering during rolling and unrolling of the window covering.

21. A retractable window covering including a light control element having first and second parallel sheets (32,34) and a plurality of adjustable transverse vanes (36) attached to said sheets along attachment lines, said vanes being carried between and connecting said sheets, a first elongate member (40) having a channel (44) and a cooperating retainer member (46) is attached along the bottom edge of said first sheet and wherein a second, separate elongate member (50) also having a channel (54) and a cooperating retainer member (56), is attached along the bottom edge of the second sheet (34).

22. A retractable window covering comprising a roller (10,110,200) a light control element (30,130) windable up by said roller, a catch member (62) pivotally connected to said roller and movable between a first position pivoted inward and accommodated at least partially inside said light control element (30,130) when rolled around said roller (10,110,200), and a second position pivoted outward and engaging an associated stop member (66) fixed relative to said roller, whereby when the light control element is substantially further unwound from the roller said catch member (62) is uncovered and pivots outward from said roller to engage said stop member (66) and thereby stop rotation of said roller past a predetermined point, and whereby as the light control element is wound onto said roller said catch member pivots in against said roller and is accommodated at least partially inside the light control element when wound further onto said roller.

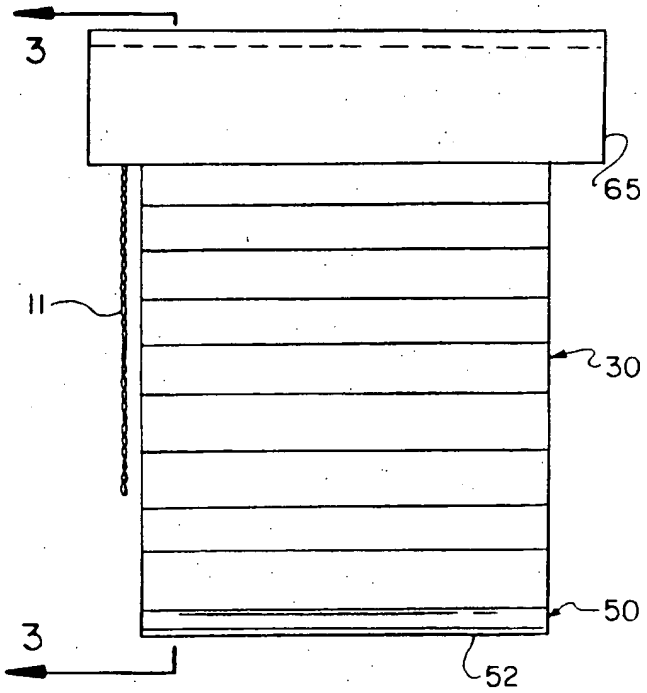


FIG. 1

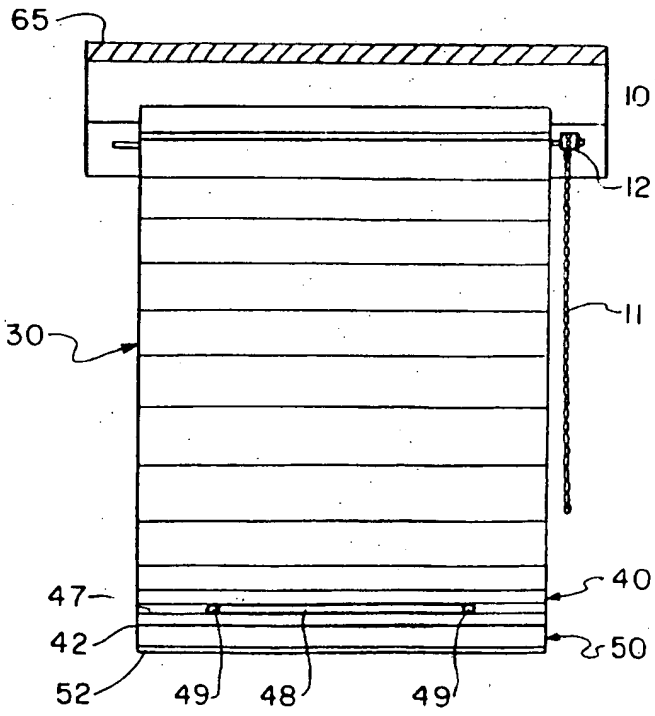
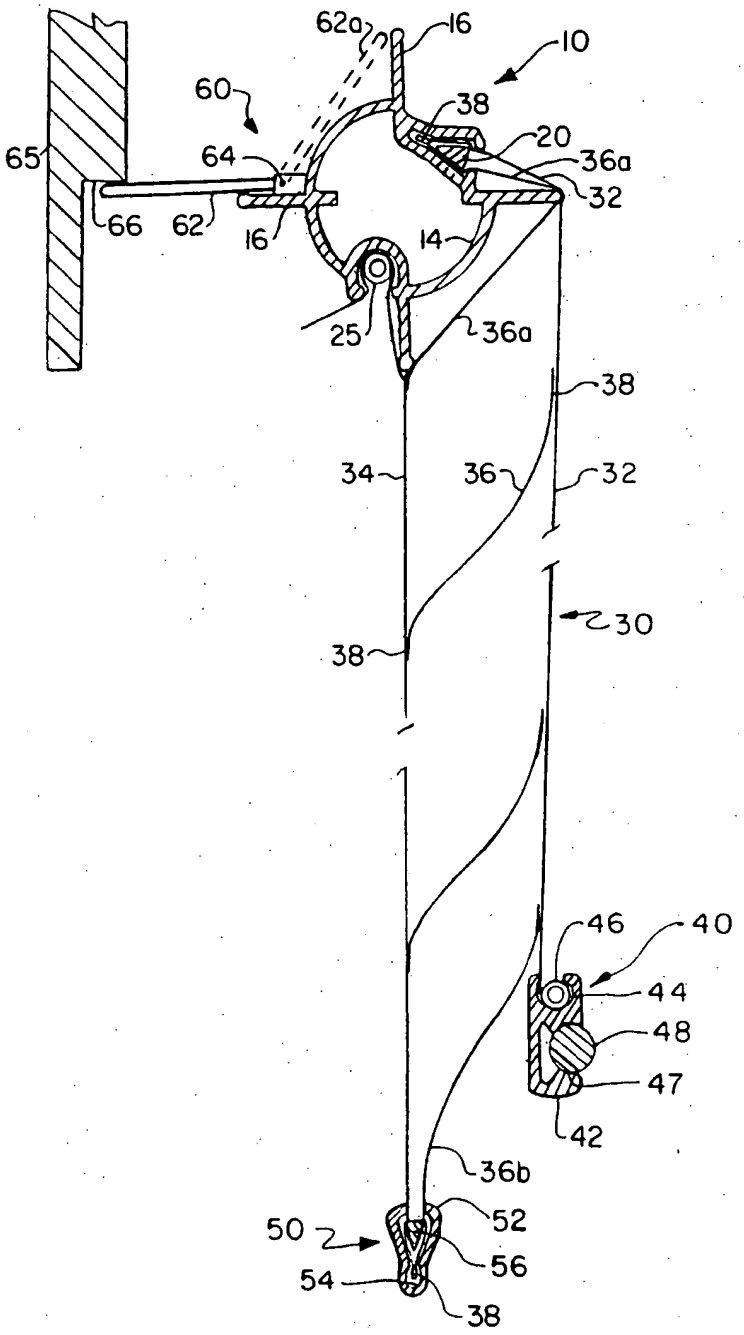


FIG. 2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38
65
64
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36a
32
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62
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36a
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34
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44
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47
42
36b
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52
56
54
38

FIG. 3

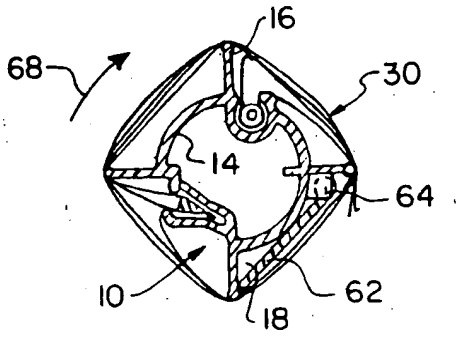


FIG. 4a

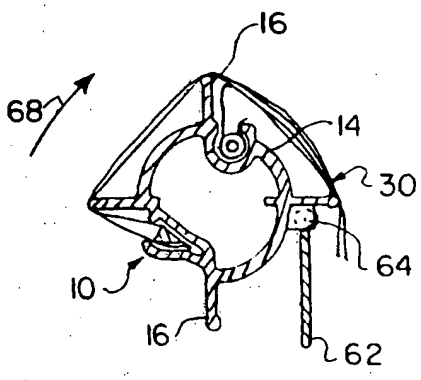


FIG. 4b

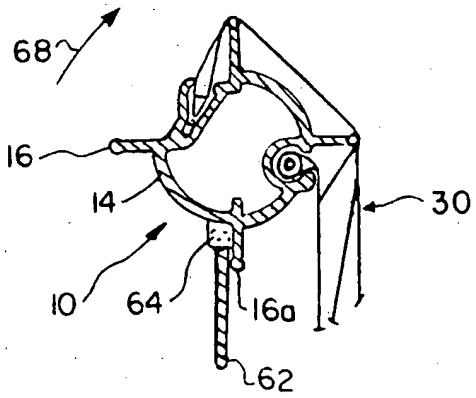


FIG. 4c

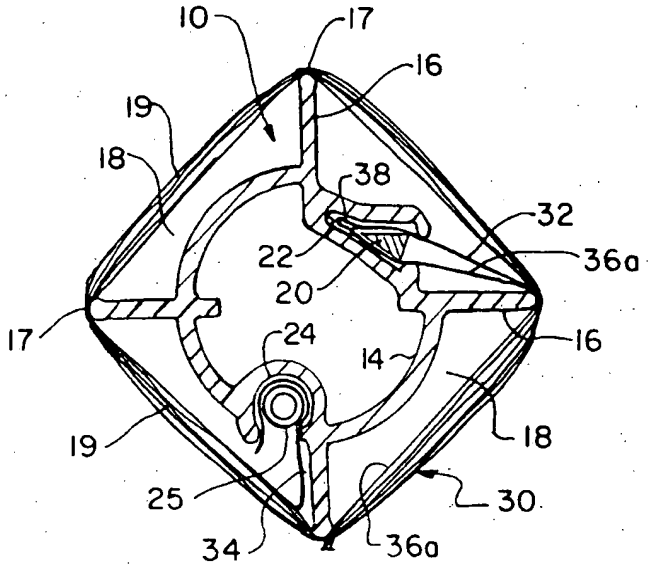


FIG. 5

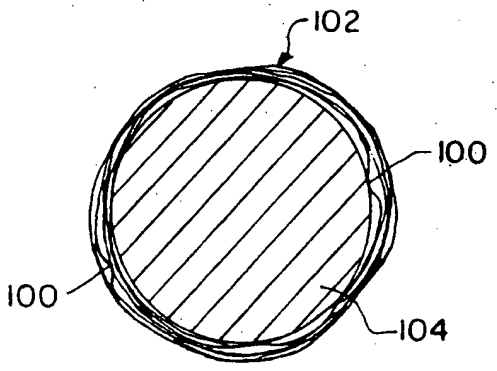


FIG. 6
PRIOR ART

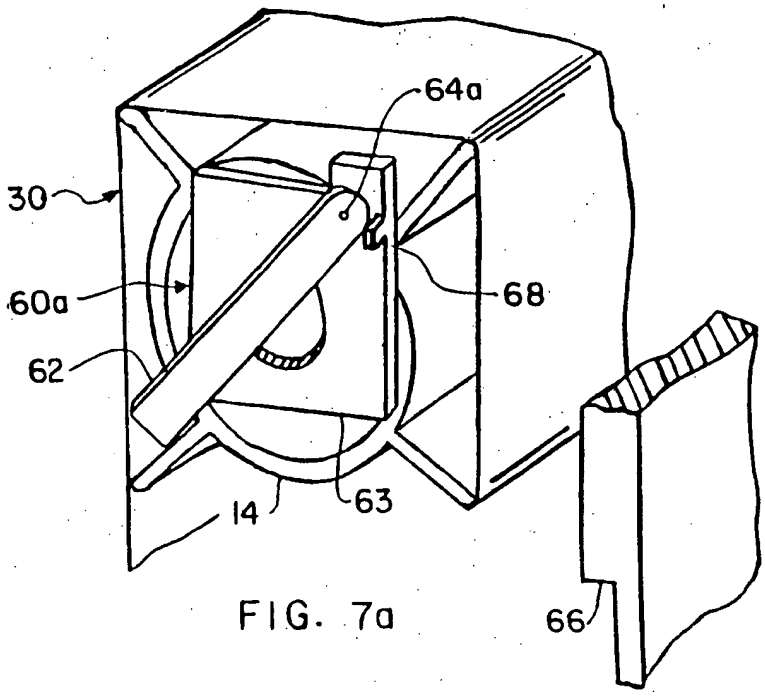


FIG. 7a

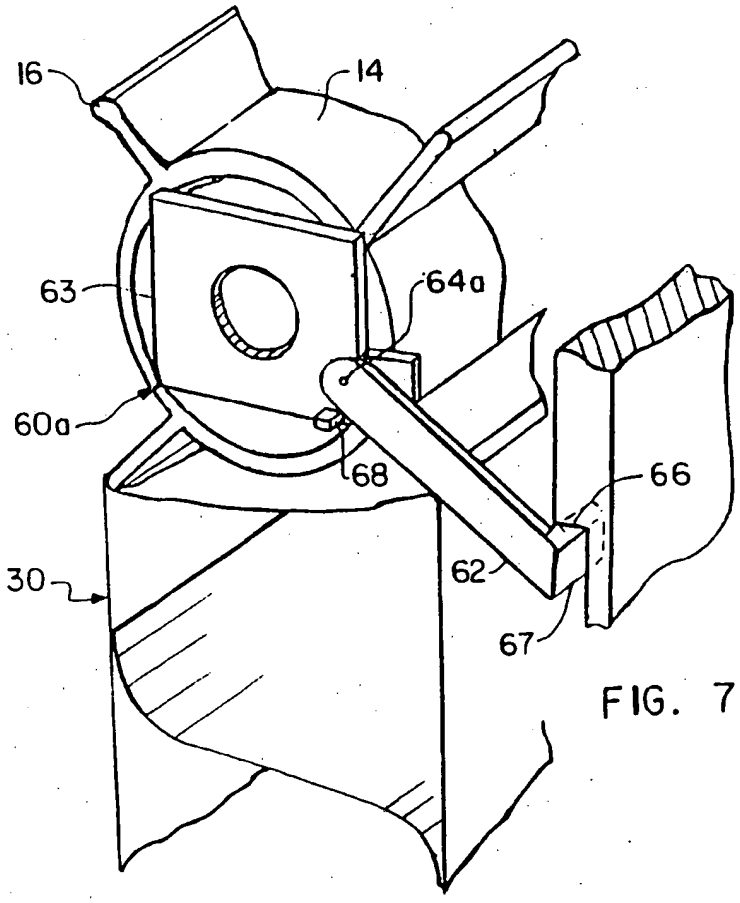


FIG. 7b

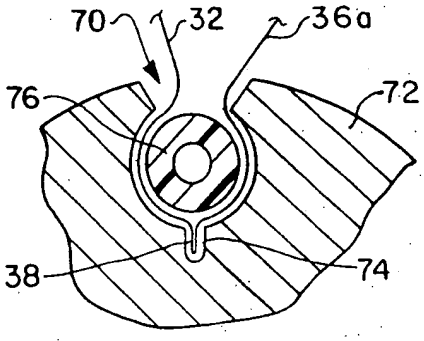


FIG. 8

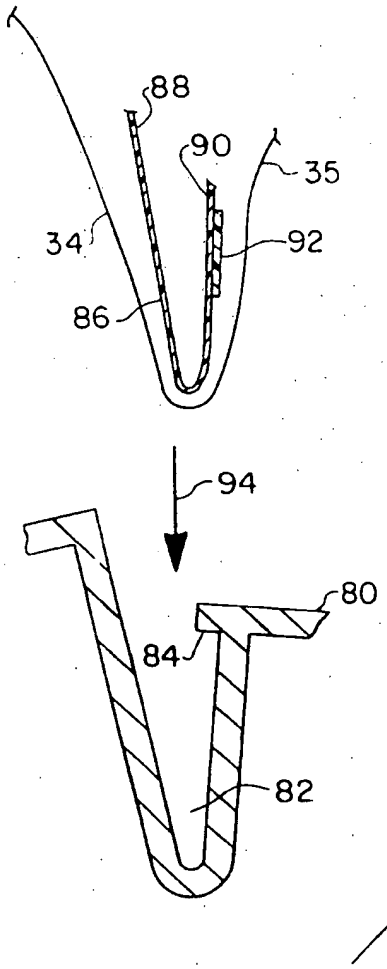


FIG. 9a

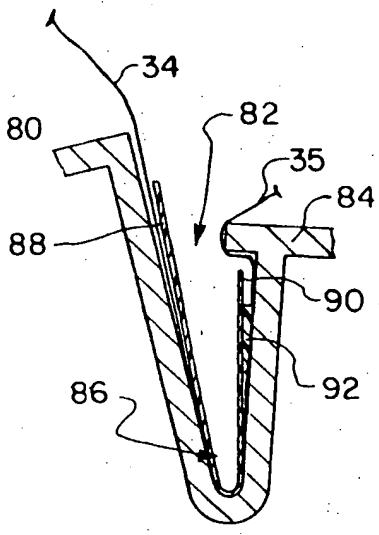
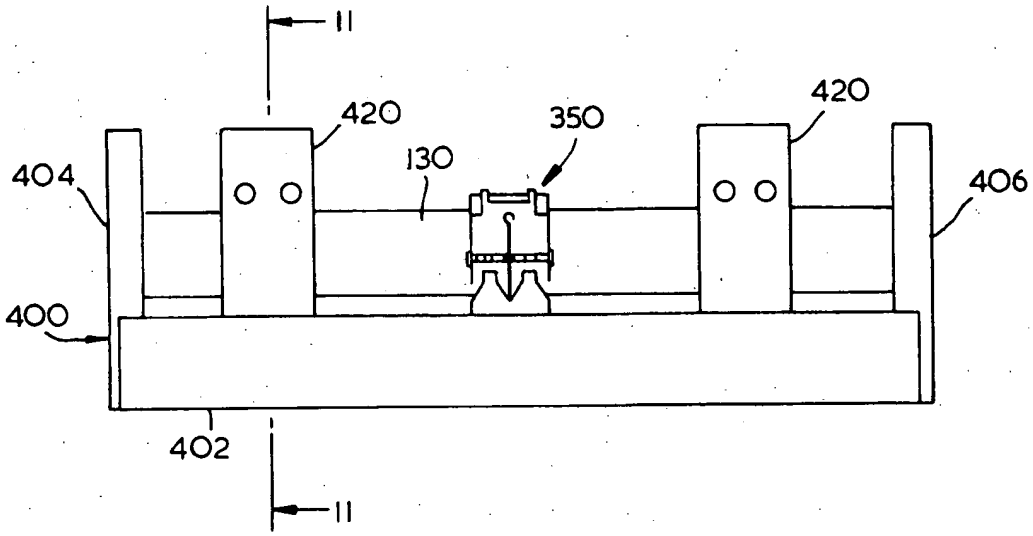


FIG. 9b

FIG. 10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130
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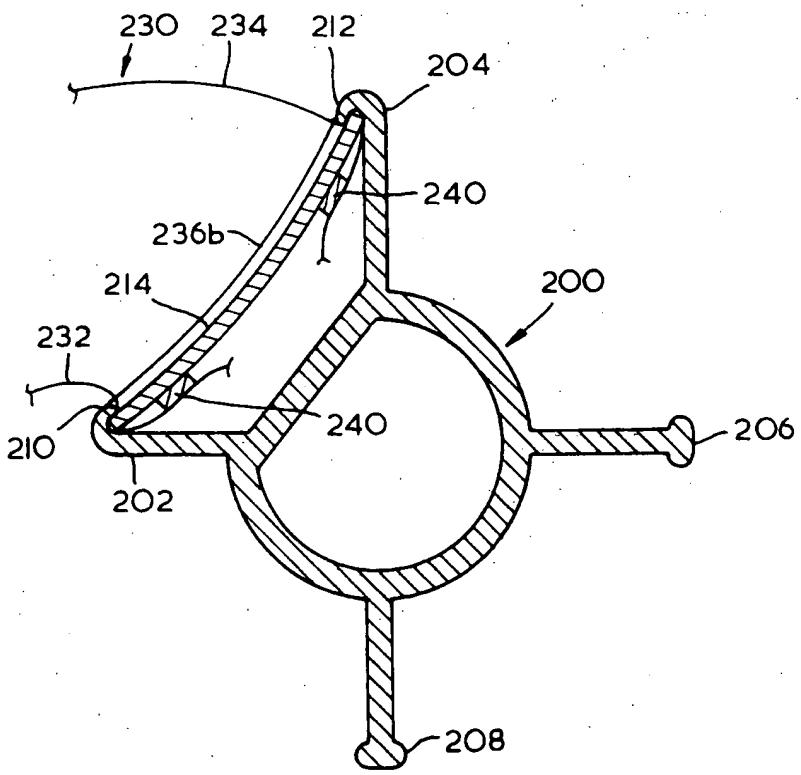
11

FIG. 13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236b
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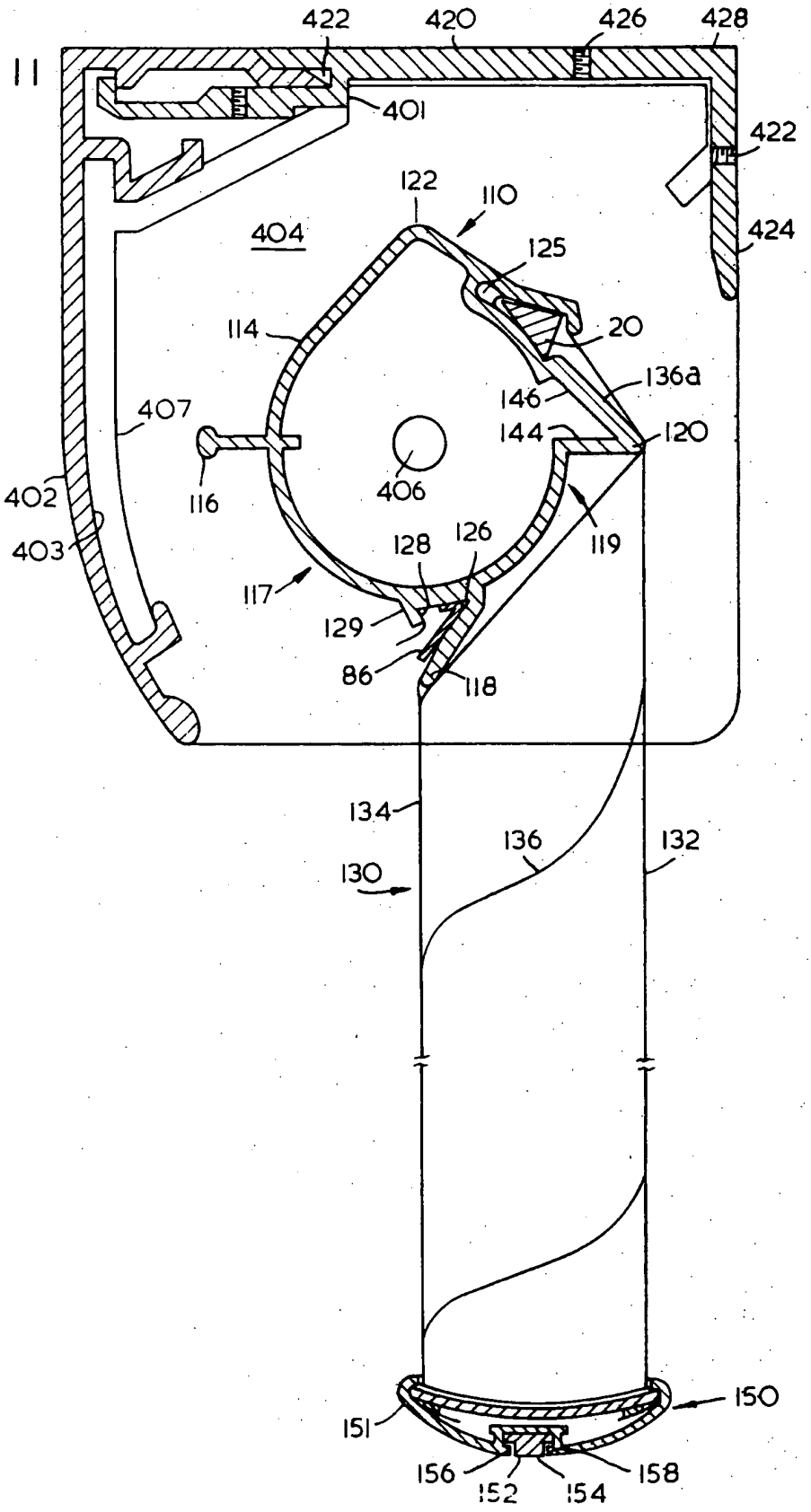
202
208

FIG. 11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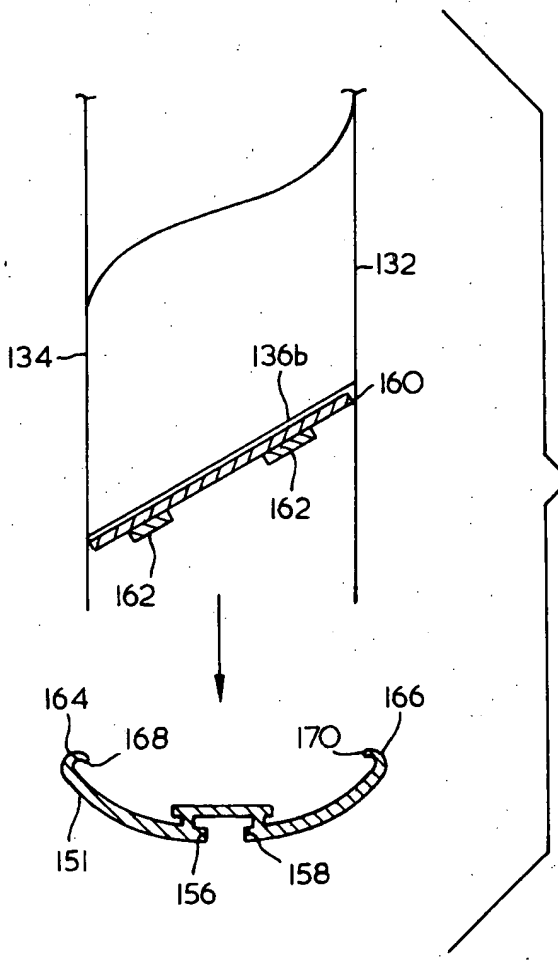


FIG. 12a

FIG. 12b

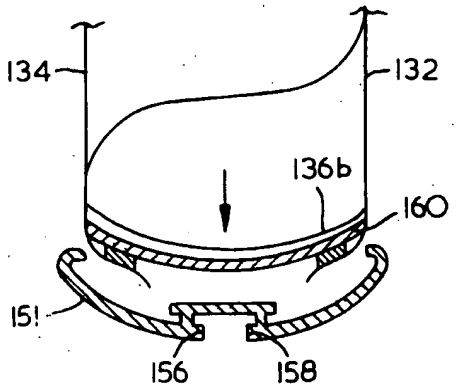


FIG. 12c

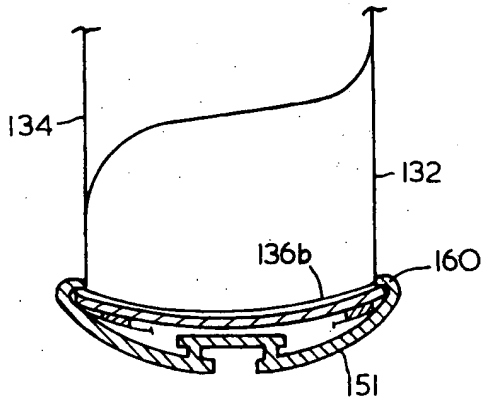


FIG. 14c

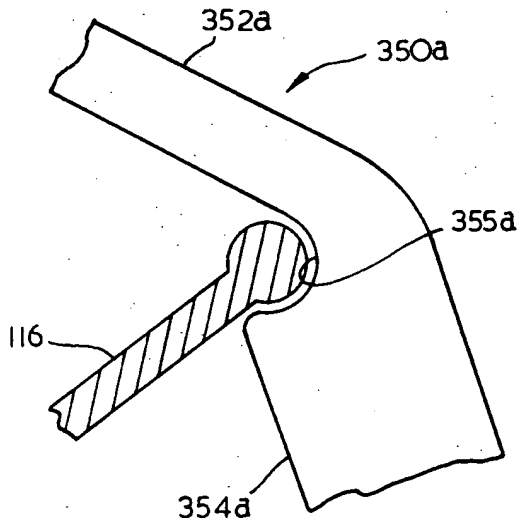


FIG. 14a

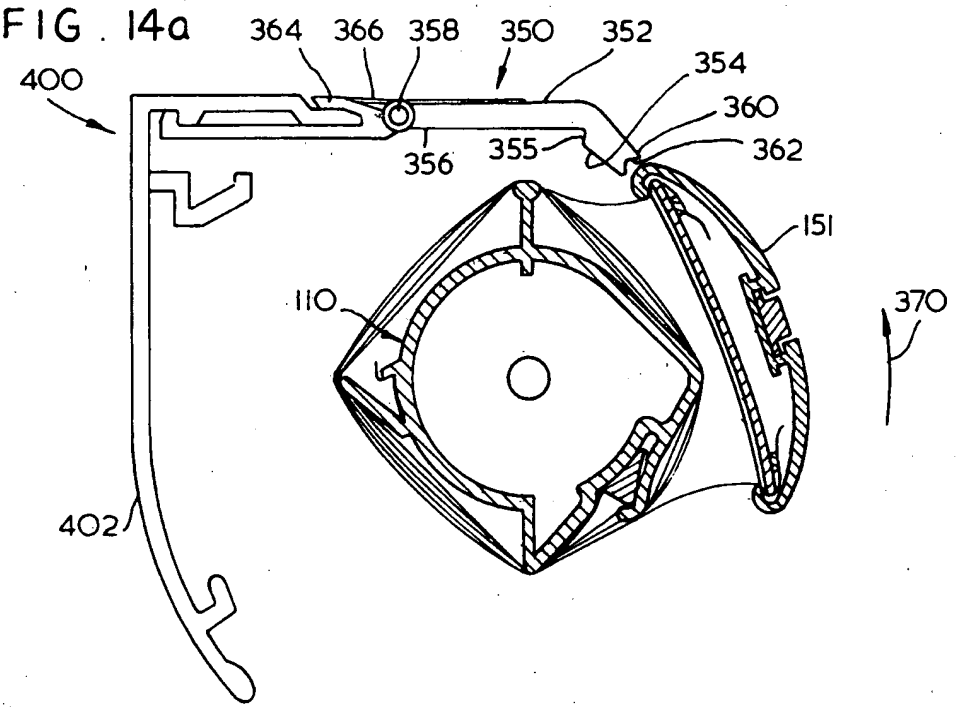
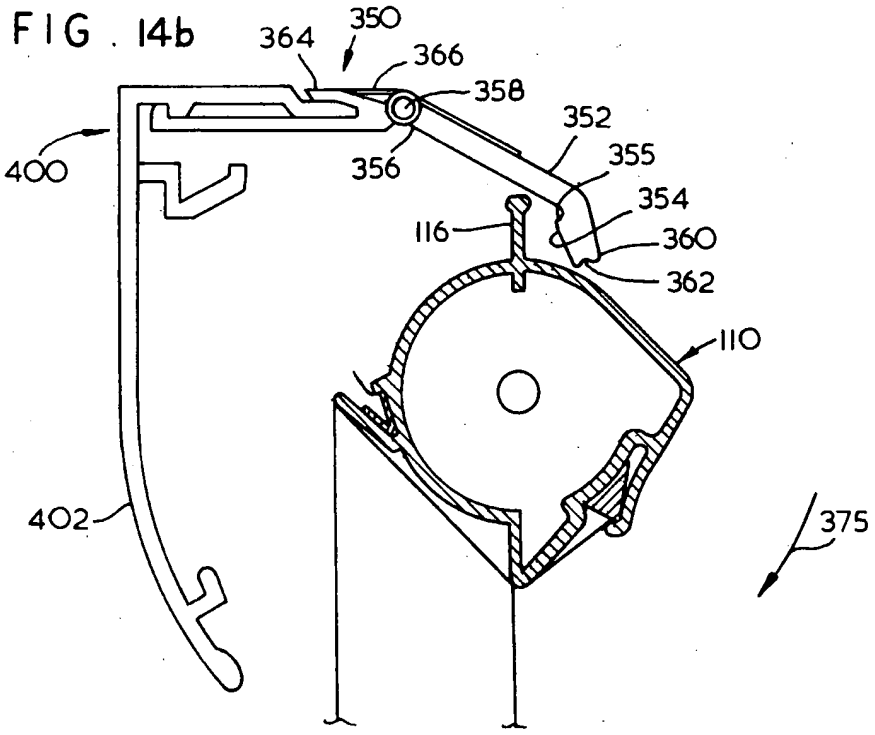


FIG. 14b



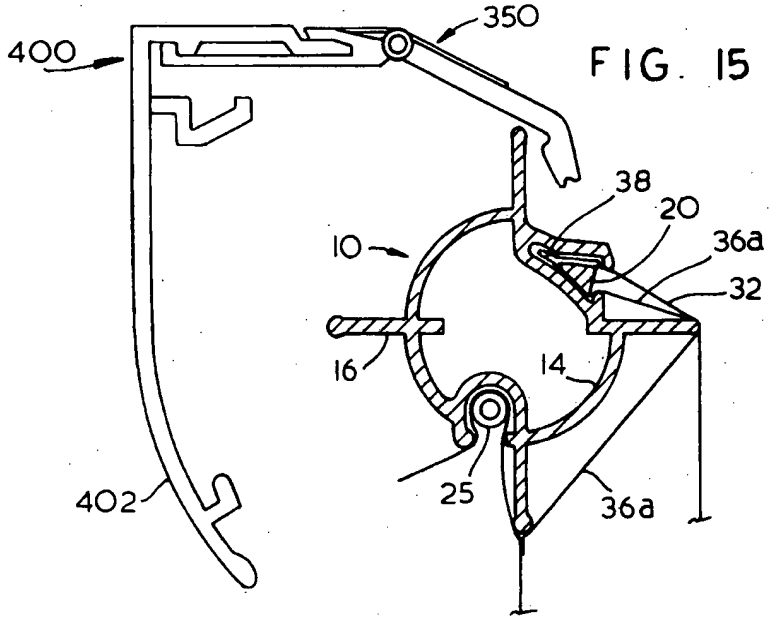

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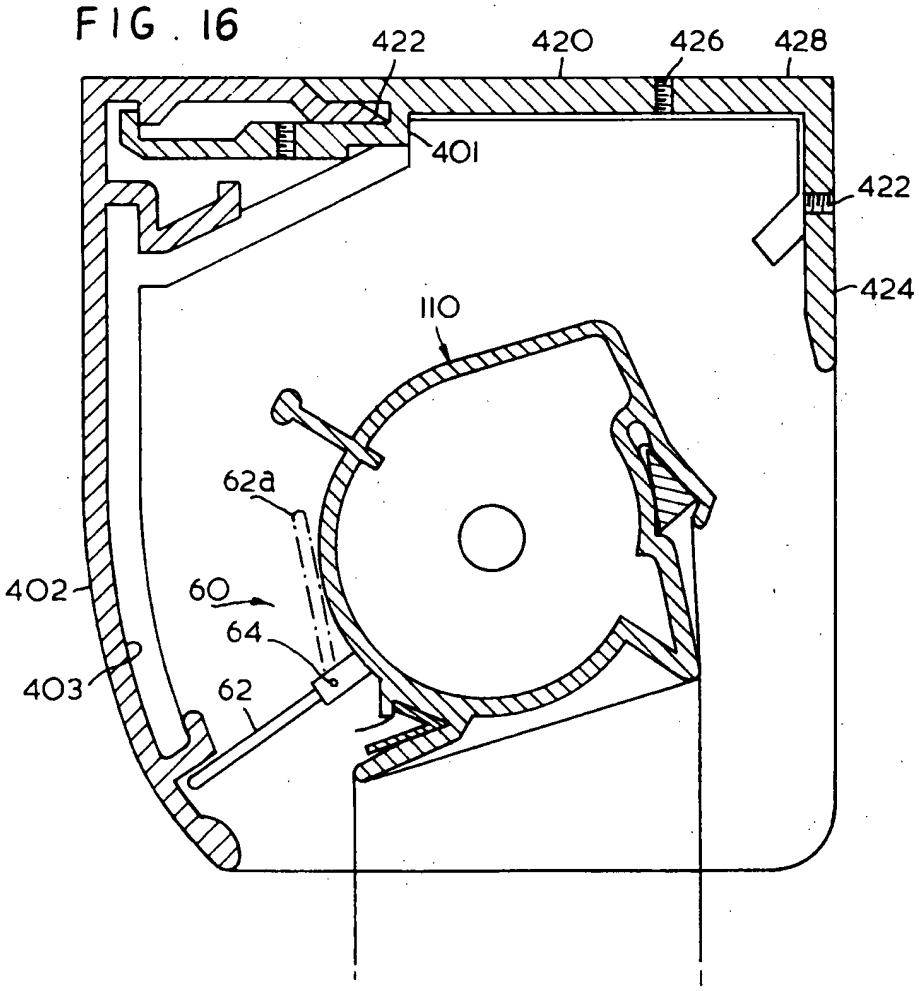
FIG. 15

FIG. 16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